Supplementary material

Content

Methods S1. Illness-death model

We used an illness-death model (Figure S1) for the projection of diabetes prevalence. In this model, the population is divided into the three states “No diabetes”, “Diabetes” and “Dead”. The transition rates between these states are the incidence rate *i* and the mortality rates without (m_0) and with diabetes (m_1). The prevalence p is the proportion of the population in the state “Diabetes”. The prevalence and transition rates in the model depend on calendar time t (period) and age a. Brinks and Landwehr(1) showed that this illness-death model is governed by a partial differential equation that describes the temporal change in prevalence in dependence of the transition rates. The partial differential equation reads $\partial p = (1 - p) \times [\, i - p\,(m_1 - m_0)]$ where ∂p the temporal change in p.

In case of children and adolescents aged <20 years, it was shown that the mortality rates can be neglected, because they are very low and only have a negligible impact on the change in prevalence in this age group.(2) Hence, the temporal change in prevalence can be adequately described with the following partial differential equation: $\partial p = (1 - p) \times i$.(2)

Methods S2. Classification of race and ethnicity in the population projections and the SEARCH study

The U.S. Census Bureau provides population projections according to the "Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity" issued by the Office of Management and Budget in 1997. In contrast, SEARCH uses the "Statistical Policy Directive 15, Race and Ethnic Standards for Federal Statistics and Administrative Reporting" from 1977. Only the former standard includes a multiple-race category. For current population estimates, the National Center for Health Statistics provides race-bridged data, which transforms multiple-race data to single-race data.(3) Unfortunately, race-bridged population projections are not available. Hence, we used a simplified bridging method by allocating the projected population from the multiple-race category to single-race categories used by SEARCH. For this allocation, we used the distribution of the primary race among those in the multiple-race group, as reported in Ingram et al.(4) To assess the impact of the simplified bridging method in this study, we compared the estimated number of youth with diabetes in 2017 using the race-bridged population estimates from the National Center for Health Statistics (Table S1) with the same numbers using the population projections in combination with the simplified bridging method (Table S2). Relative differences >5 % were observed in two age groups among Non-Hispanic Other (Table S2). All other differences were < 5 % and much smaller on average. In particular, the total number over all race and ethnicity strata only differed by a maximum of 1.1 % (Table S2). Hence, we concluded that the impact of the simplified bridging method on our results is negligible, particularly in comparison to the statistical uncertainty and the difference between the scenarios described in the main text.

Methods S3. Monte Carlo simulation

To account for the statistical uncertainty of the input data, we calculated 95%-confidence intervals (95%-CI) based on a Monte Carlo simulation. We repetitively drew random samples from the distributions of the input data from the SEARCH study and calculated all projection scenarios 1,000 times. We report the median (2.5th and 97.5th percentile) of the resulting distribution of projected prevalence estimates as the point estimate (95%-CI).

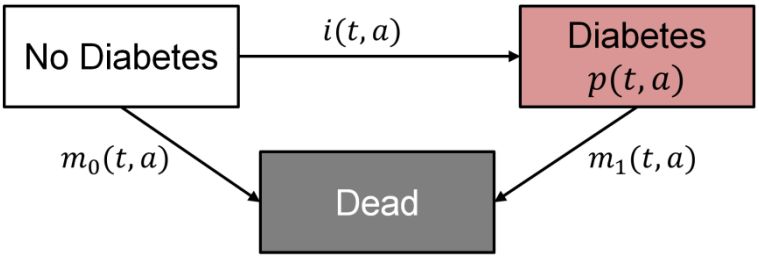

Figure S1. Illness-death model

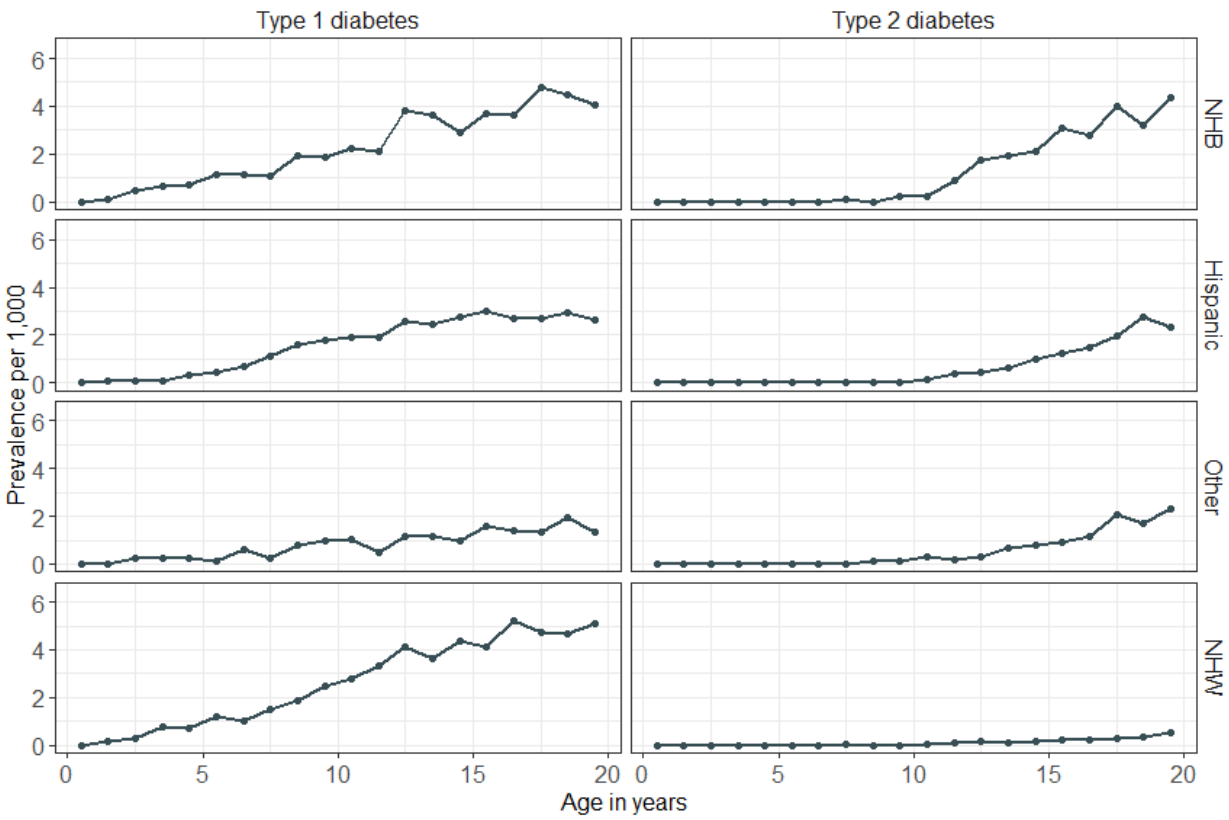

Figure S2. Prevalence of diabetes among girls/women aged <20 years in the U.S. in 2017.

Abbreviations: NHB, non-Hispanic Black; NHW, non-Hispanic White

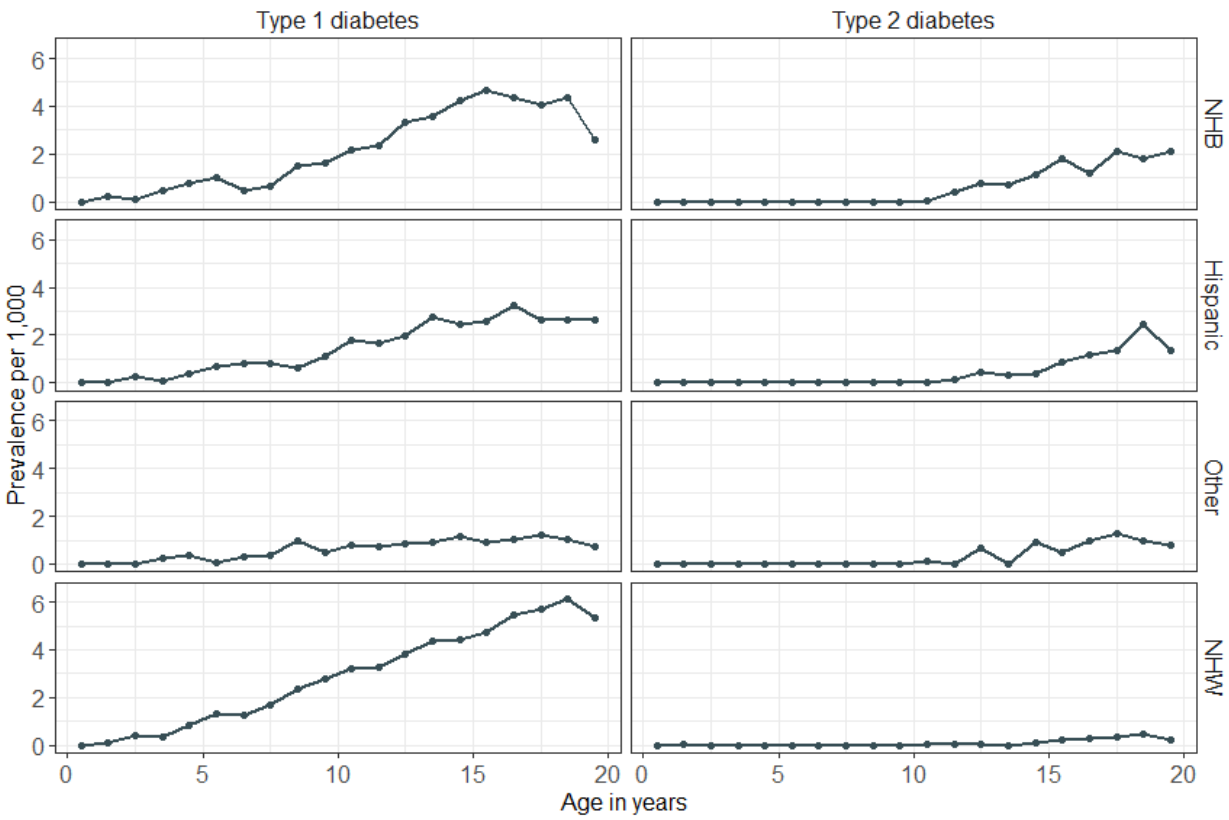

Figure S3. Prevalence of diabetes among boys/men aged <20 years in the U.S. in 2017.

Abbreviations: NHB, non-Hispanic Black; NHW, non-Hispanic White

Table S1. Estimated number of youth aged <20 years in the United States with diabetes in 2017, by age category, race and ethnicity and sex using race-bridged population estimates.

Age Category	0-4 yrs.		5-9 yrs.		10-14 yrs.				15-19 yrs.				All Ages Combined (Total)			
Diabetes type	Type 1		Type 1		Type 1		Type 2		Type 1		Type 2		Type 1		Type 2	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
NHW	1918	1816	8237	10191	19748	21702	557	201	26955	32662	1869	1855	56868	66368	2448	2087
NHB	589	497	2165	1683	4432	4857	2059	934	6526	6501	5450	2923	13731	13545	7614	3844
Hispanic/Latino	277	430	2873	2163	5806	5542	1295	667	6684	6836	4642	3586	15627	14983	5921	4253
Other	98	87	396	331	671	664	293	215	1088	715	1032	587	2249	1796	1352	802
TOTAL	2883	2831	13722	14494	30815	32980	4131	1970	41442	46996	12800	8837	88874	97291	17067	10847

Abbreviations: CI, confidence interval; NHW, non-Hispanic White; NHB, non-Hispanic Black

Table S2. Estimated number of youth aged <20 years in the United States with diabetes in 2017, by age category, race and ethnicity and sex using population projections estimates.

Age Category	0-4 yrs.		5-9 yrs.		10-14 yrs.				15-19 yrs.				All Ages Combined (Total)			
Diabetes type	Type 1		Type 1		Type 1		Type 2		Type 1		Type 2		Type 1		Type 2	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
NHW	1916 (-0.1)	1815 (-0.1)	8239 (0.0)	10206 (0.1)	19768 (0.1)	21749 (0.2)	557 (0.0)	202 (0.5)	27021 (0.2)	32734 (0.2)	1874 (0.3)	1859 (0.2)	56955 (0.2)	66499 (0.2)	2453 (0.2)	2092 (0.2)
NHB	575 (-2.4)	484 (-2.6)	2111 (-2.5)	1637 (-2.7)	4343 (-2.0)	4743 (-2.3)	2018 (-2.0)	912 (-2.4)	6418 (-1.7)	6372 (-2.0)	5361 (-1.6)	2866 (-2.0)	13466 (-1.9)	13242 (-2.2)	7482 (-1.7)	3765 (-2.1)
Hispanic/ Latino	277 (0.0)	428 (-0.5)	2871 (-0.1)	2158 (-0.2)	5800 (-0.1)	5524 (-0.3)	1294 (-0.1)	665 (-0.3)	6670 (-0.2)	6829 (-0.1)	4633 (-0.2)	3586 (0.0)	15603 (-0.2)	14954 (-0.2)	5910 (-0.2)	4250 (-0.1)
Other	104 (6.1)	91 (4.6)	416 (5.1)	348 (5.1)	698 (4.0)	690 (3.9)	303 (3.4)	223 (3.7)	1110 (2.0)	732 (2.4)	1051 (1.8)	600 (2.2)	2323 (3.3)	1859 (3.5)	1384 (2.4)	823 (2.6)
TOTAL	2881 (-0.1)	2826 (-0.2)	13638 (-0.6)	14353 (-1.0)	30611 (-0.7)	32744 (-0.7)	4181 (1.2)	2002 (1.6)	41221 (-0.5)	46665 (-0.7)	12929 (1.0)	8899 (0.7)	88341 (-0.6)	96556 (-0.8)	17249 (1.1)	10942 (0.9)

Abbreviations: CI, confidence interval; NHW, non-Hispanic White; NHB, non-Hispanic Black

Numbers in brackets are relative differences in percent between estimates in Table S1 and S2.

Table S3. Results for short-term projections.

	Year 2030				Year 2040			
	Constant incidence*		Increasing incidence†		Constant incidence*		Increasing incidence†	
	Prevalence per 1000 youths (95% CI)	No. of cases in 1000s (95% CI)	Prevalence per 1000 youths (95% CI)	No. of cases in 1000s (95% CI)	Prevalence per 1000 youths (95% CI)	No. of cases in 1000s (95% CI)	Prevalence per 1000 youths (95% CI)	No. of cases in 1000s (95% CI)
Type 1 diabetes	2.2 (2;2.6)	189 (169;215)	2.3 (2;2.6)	194 (171;221)	2.2 (2;2.6)	193 (170;221)	2.6 (2.1;3.2)	221 (181;272)
Hispanic/ Latino	1.6 (1.4;1.9)	36 (31;44)	1.7 (1.4;2)	37 (31;45)	1.6 (1.4;1.9)	40 (34;48)	1.8 (1.4;2.4)	45 (35;58)
NHB	2.2 (1.8;2.7)	28 (24;34)	2.3 (1.9;2.8)	30 (25;36)	2.2 (1.8;2.7)	29 (24;36)	3 (2.2;4)	40 (30;54)
NHW	2.8 (2.6;3.1)	118 (110;129)	2.9 (2.6;3.1)	120 (111;131)	2.9 (2.7;3.2)	116 (107;127)	3.2 (2.8;3.6)	127 (112;143)
Other races	0.8 (0.6;1.2)	6 (4;9)	0.9 (0.6;1.3)	6 (4;9)	0.9 (0.6;1.3)	7 (5;11)	1.1 (0.6;2)	9 (5;16)
Type 2 diabetes	0.5 (0.4;0.6)	40 (35;49)	0.5 (0.4;0.6)	42 (35;52)	0.5 (0.4;0.6)	44 (37;53)	0.8 (0.6;1)	65 (50;89)
Hispanic/ Latino	0.6 (0.5;0.7)	13 (11;16)	0.6 (0.5;0.7)	14 (12;16)	0.6 (0.5;0.7)	14 (12;17)	0.8 (0.6;1)	20 (15;25)
NHB	1.4 (1.2;1.6)	18 (15;21)	1.4 (1.2;1.7)	19 (16;22)	1.4 (1.3;1.7)	19 (17;23)	2.4 (1.9;3.1)	32 (26;41)
NHW	0.1 (0.1;0.2)	5 (4;7)	0.1 (0.1;0.2)	6 (4;7)	0.1 (0.1;0.2)	5 (4;7)	0.2 (0.1;0.2)	6 (5;9)
Other races	0.5 (0.4;0.8)	4 (3;6)	0.5 (0.5;0.9)	4 (3;6)	0.6 (0.5;0.9)	4 (4;7)	0.8 (0.6;1.5)	6 (5;12)

Abbreviations: CI, confidence interval; NHW, non-Hispanic White; NHB, non-Hispanic Black

* In the constant incidence scenario, prevalence was projected under the assumption that the incidence rate did not change between 2017 and 2060.

† In the increasing incidence scenario, prevalence was projected under the assumption that trends in incidence observed between 2002 and 2017 continued until 2060.

Table S4. Sensitivity analysis for the projected prevalence and number of children and adolescents with diabetes in the U.S., 2060.

	Type 1 diabetes		Type 2 diabetes	
Attenuation of incidence trend by	**No. of cases in 1,000s (95% CI)**	**No. of cases prevented in 1,000s (95% CI)***	**No. of cases in 1,000s (95% CI)**	**No. of cases prevented in 1,000s (95% CI)***
1% annually	227 (154;367)	-75 (-260;86)	167 (100;308)	-49 (-235;112)
2% annually	167 (114;257)	-138 (-322;-1)	126 (75;224)	-92 (-289;45)
3% annually	123 (83;190)	-183 (-286;-122)	95 (56;173)	-125 (-233;-73)

Abbreviations: CI, confidence interval; NHW, non-Hispanic White; NHB, non-Hispanic Black.

* In comparison to the increasing incidence scenario described in the main text

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4. Ingram D, Parker J, Schenker N, Weed J, Hamilton B, Arias E, Madans J. United States Census 2000 population with bridged race categories. Vital Health Stat 2003;2